

WHAT IS CLAIMED IS:

1. A method for preparing a positive active material for a rechargeable lithium battery comprising:

mixing a lithium source, a metal source, and a doping liquid comprising a doping element to form a mixture; and

heat-treating the mixture.

2. The method according to claim 1, wherein the doping element is selected from the group consisting of Mg, Al, Co, K, Na, Ca, Si, Ti, Sn, V, Ge, Ga, B, As, Zr, Ni, Mn, Cr, Sr, rare earth metals, and mixtures thereof.

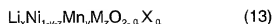
3. The method according to claim 1, wherein the doping liquid comprises a volatile solvent or water.

4. The method according to claim 1, wherein the doping liquid comprises alcohol.

5. The method according to claim 1, wherein the metal source is at least one compound selected from the group consisting of manganese sources, nickel sources, and cobalt sources.

6. The method according to claim 1, wherein the positive active material is selected from the group consisting of compounds represented by the formulas 1 to 13:





wherein

$$0.95 \leq x \leq 1.1, 0 \leq y \leq 0.5, 0 \leq z \leq 0.5, 0 < a \leq 2;$$

M is selected from the group consisting of Mg, Al, Co, K, Na, Ca, Si, Ti, Sn, V, Ge, Ga, B, As, Zr, Ni, Mn, Cr, Sr, rare earth metals, and mixtures thereof;

A is selected from the group consisting of O, F, S, and P; and

X is selected from the group consisting of F, S, and P.

7. The method according to claim 1, wherein the heat-treating step comprises a first heat-treating at a temperature ranging from 400℃ to 500℃; and a second heat-treating at a temperature ranging from 700℃ to 900℃.

8. The method according to claim 7, wherein the first heat-treating step is maintained for 5 hours to 20 hours; and the second heat-treating step is maintained for 10 hours to 30 hours.

9. The method according to claim 1, wherein the heat-treating step is performed at a temperature ranging from 400℃ to 900℃.

10. A method for preparing a positive active material for a rechargeable lithium battery comprising:

mixing a lithium source; at least one metal source including at least one of a cobalt source, a manganese source, and a nickel source; and a doping liquid comprising a doping element selected from the group consisting of Mg, Al, Co, K, Na, Ca, Si, Ti, Sn, V, Ge, Ga, B, As, Zr, Ni, Mn, Cr, Sr, rare earth metals, and mixtures thereof to form a mixture; and

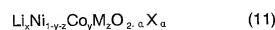
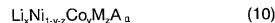
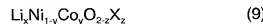
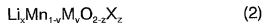
heat-treating the mixture.

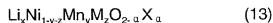
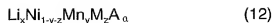
11. The method according to claim 10, wherein the doping liquid comprises a volatile solvent or water.

12. The method according to claim 10, wherein the doping liquid comprises alcohol.

13. The method according to claim 10, wherein the positive active material is selected from the group consisting of compounds represented by the formulas 1 to

13:





wherein

$$0.95 \leq x \leq 1.1, 0 \leq y \leq 0.5, 0 \leq z \leq 0.5, 0 < a \leq 2;$$

M is selected from the group consisting of Mg, Al, Co, K, Na, Ca, Si, Ti, Sn, V, Ge, Ga, B, As, Zr, Ni, Mn, Cr, Sr, rare earth metals, and mixtures thereof;

A is selected from the group consisting of O, F, S, and P; and

X is selected from the group consisting of F, S, and P.

14. The method according to claim 10, wherein the heat-treating step comprises a first heat-treating at a temperature ranging from 400°C to 500°C; and a second heat-treating at a temperature ranging from 700°C to 900°C.

15. The method according to claim 14, wherein the first heat-treating step is maintained for 5 hours to 20 hours; and the second heat-treating step is maintained for 10 hours to 30 hours.

16. The method according to claim 10, wherein the heat-treating step is performed at a temperature ranging from 400°C to 900°C.

17. A method for preparing a positive active material for a rechargeable lithium battery comprising:

mixing a lithium source; at least one metal source including at least one of a cobalt source, a manganese source, and a nickel source; and an Al-including doping liquid or a B-including doping liquid to form a mixture; and

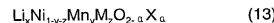
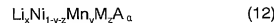
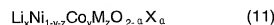
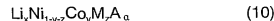
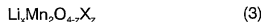
heat-treating the mixture.

18. The method according to claim 17, wherein the doping liquid comprises

a volatile solvent or water.

19. The method according to claim 17, wherein the doping liquid comprises alcohol.

20. The method according to claim 17, wherein the positive active material is selected from the group consisting of compounds represented by the formulas 1 to 13:



wherein

$$0.95 \leq x \leq 1.1, 0 \leq y \leq 0.5, 0 \leq z \leq 0.5, 0 < a \leq 2;$$

M is selected from the group consisting of Mg, Al, Co, K, Na, Ca, Si, Ti, Sn, V, Ge, Ga, B, As, Zr, Ni, Mn, Cr, Sr, rare earth metals, and mixtures thereof;

A is selected from the group consisting of O, F, S, and P; and

X is selected from the group consisting of F, S, and P.

21. The method according to claim 17, wherein the heat-treating step comprises a first heat-treating at a temperature ranging from 400°C to 500°C; and a second heat-treating at a temperature ranging from 700°C to 900°C.

22. The method according to claim 21, wherein the first heat-treating step is maintained for 5 hours to 20 hours; and the second heat-treating step is maintained for 10 hours to 30 hours.

23. The method according to claim 17, wherein the heat-treating step is performed at a temperature ranging from 400°C to 900°C.

24. The method according to claim 17, wherein the metal source is a cobalt source, and the doping liquid is an Al-including doping liquid.

25. The method according to claim 17, wherein the metal source is a manganese source or a nickel source, and the doping liquid is an Al-including doping liquid.

26. The method according to claim 17, wherein the metal source is a manganese source or a nickel source, and the doping liquid is a B-including doping liquid.